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REMARKS

Claims 1-27 are pending in this application.

Claims 1-27 are rejected.

The office action dated May 22, 2003 indicates that claims 1-3, 18-19 and 26 are rejected under 35 USC §102(b) as being anticipated by Mohan (U.S. Patent No. 5,499,178); claims 1-3, 5, 18-19 and 26 are rejected under 35 USC §102(b) as being anticipated by Hosoda (U.S. Patent No. 5,407,909) or Mohan et al. (U.S. Patent No. 5,548,165); and claims 1-3, 18-19 and 26 are rejected under 35 USC §102(b) as being anticipated by Cook et al. (U.S. Patent No. 4,967,334). The office action also indicates that claims 4-17, 20-25 and 27 are rejected under 35 USC §103(a) as being unpatentable over Mohan in view of VeNard (U.S. Patent No. 4,967,334). These rejections are respectfully traversed.

Claim 1 recites a power distribution system including an ac source connected to a power bus, a capacitor bank shunt-connected to the power bus, and an active filter shunt connected to a power bus. The active filter includes an inverter, an inverter control and current sensors. Each current sensor senses current flowing through a corresponding capacitor of the capacitor bank. In response to the current sensors, the inverter control controls the inverter to inject harmonic currents into the power bus.

Because currents are sensed in the capacitor banks instead of the power line, the sensing of lower currents allows for greater resolution of the harmonic currents. It also allows smaller current sensors to be used. Use of smaller current sensors can result in significant cost, size, and weight savings. Moreover, the harmonic currents are dealt with without cutting into the main distribution system. This last advantage is especially desirable for aircraft power distribution systems, where the main distribution current can be quite large.

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'102 and '103 rejections of claims 1-17 in view of Mohan '178

Mohan discloses an ac-to-dc power conversion system. The system 10 of Figure 2 includes a three-phase source 34 for providing three-phase ac power on lines 40a, 40b and 40c (col. 6, line 47), and a diode rectifier 42 for rectifying the ac power to dc power (col. 6, lines 60-64). The dc power is provided on dc lines 44a and 44b.

A modulator 46 is connected across the dc lines 44a and 44b. A harmonic current reducing circuit 30 is connected to rectifier 42 at output lines 44a and 44b (col. 6, line 65-66). An impedance network 71 is connected to the lines 40a, 40b and 40c. The impedance network 71 includes three impedance branches that inject harmonic currents into the ac lines 40a, 40b and 40c (col. 7, lines 41-60).

Mohan does not disclose an inverter that is shunt-connected across the ac lines 40a, 40b and 40c, nor does it disclose an impedance network that is shunt connected to the ac lines 40a, 40b and 40c. Mohan does not teach or suggest current sensors for sensing current flowing through capacitors that are shunt connected to the lines 40a, 40b and 40c, nor does he disclose an inverter control that, in response to the current sensors, controls an inverter to inject harmonic currents into the lines 40a, 40b and 40c.

The office action cites Figures 7, 11 and 12. Figures 11 and 12 simply show variations of the impedance network 71, and Figure 7 is no more relevant than figure 2

Thus, Mohan does not teach or suggest the system of claim 1. Therefore, claim 1 and its dependent claims 2-17 should be allowed over Mohan alone.

VeNard does not teach or suggest the differences between claim 1 and Mohan. Therefore, claims 1-17 should be allowed over the combination of Mohan and VeNard.

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'102 rejections of claims 1-3 and 5 in view of Mohan et al. '165

Mohan et al., disclose an active power filter 24 connected to a capacitor 26 and an ac source 14 via switches 30 and 32 and a power line 18. A load 16 is connected to the ac source 14 via a power line 20.

The active filter 24 includes an inverter 50 and controller 52. The controller 52 receives measured values of load current I_L , terminal voltage, and voltage across the active filter 24 (col. 4, line 65 to col. 5, line 3). During operation, the active filter 24 is operated to provide distortion current to the load 16 (Figure 1D and col. 3, lines 53+), or it is operated to draw a current through the capacitor 26 (Figure 1c, and col. 3, lines 40+).

Mohan et al. do not teach or suggest an active filter that injects harmonic currents into the power line 18. Mohan et al. do not teach or suggest current sensors for sensing current flowing through capacitors connected to the power lines 18 or 20. Mohan et al. do not teach or suggest an inverter control that is responsive to measurements of current flowing through such capacitors. Therefore, claim 1 and its dependent claims 2-17 should be allowable over Mohan et al. '165.

'102 rejections of claims 1-3 and 5 in view of Hosoda

Hosoda discloses a first power converter 1 for producing ac current having a variable frequency; and a current detector 2 for generating a sense current I_S . The sense current I_S is supplied to a higher harmonic detector 3, which produces a three-phase current reference. The current reference is used by a second power converter.

In each of Figures 1-5, the current detector 2 is "attached at the output side of the first power converter 1." Hosoda does not teach or suggest sensing current that flows through capacitors of a capacitor bank shunt connected to a power line. For this reason alone, claim 1 and its dependent claims 2-17 should be allowable over Hosoda.

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'102 rejections of claims 1-3 in view of Cook et al. '334

Cook et al. disclose a generator 18 for producing variable frequency ac power, a rectifier 30 for rectifying the ac power to dc power, a dc link filter 34 including two capacitors 70 and 72 for reducing ripple voltage in the dc power produced by the rectifier (col. 4, lines 53-55), and an inverter 38 for converting the dc power to constant frequency ac power. Cook et al. do not teach or suggest current sensors for sensing current flowing through a corresponding capacitor of a capacitor bank, or an inverter control that, in response to the current sensors, controls the inverter 38 to inject harmonic currents into the power bus. For this reason alone, claim 1 and its dependent claims 2-17 should be allowable over Cook et al.

'102 rejection of claim 18

Claim 18 recites an active filter including an inverter; means for generating a plurality of different voltage commands, each voltage command corresponding to a different harmonic current; means for summing the different voltage commands with a voltage command representing inverter voltage; and means, responsive to the summing means, for controlling the inverter. The inverter is controlled to function as a current controlled-current source that injects harmonic currents into the power bus such that the current on the power bus contains only a fundamental component.

The active filter of claim 18 operates as a current controlled harmonic current source. The active filter supplies only harmonic currents to the distribution system, while creating only a fundamental current at the terminals. In this manner the active filter improves power quality.

None of the cited documents teach or suggest such an active filter. Therefore, claim 18 should be allowed over the cited documents.

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'102 and '103 rejections of claim 19-25

Claims 19-25 recite an active filter including an inverter and a plurality of control loops. Each loop corresponds to a different multiple of capacitor bank Park Vector angle. Each control loop causes the inverter to inject a different harmonic current into the power bus.

This filter can selectively eliminate characteristic harmonics, which could be application specific. It can reduce the kVA rating required of inverter power size. Reducing the kVA power rating, in turn, reduces size, weight, and cost of the inverter, which are premium in any application, particularly in the aerospace applications.

None of the cited documents teach or suggest a plurality of control loops, each loop corresponding to a different multiple of capacitor bank Park Vector angle, each control loop causing the inverter to inject a different harmonic current into the power bus. Therefore, claims 19-25 should be allowed over the cited documents.

'102 and '103 rejections of claim 26-27


Claim 26 recites a method of using an inverter to filter harmonic currents on a power bus of a power distribution system. The method includes measuring currents flowing through the capacitors of a capacitor bank, which is shunt-connected across the power bus. The inverter is controlled to inject harmonic currents into the power bus in response to the measured currents so that the inverter supplies harmonic current demands of non linear loads on the power bus.

As discussed above, none of the cited documents teach or suggest measuring currents flowing through the capacitors of a capacitor bank, which is shunt-connected across the power bus, and using that measured current to control an inverter to inject harmonic currents into the power bus. Therefore, claims 26-27 should be allowed over the cited documents.

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The examiner is respectfully requested to withdraw the rejections of the claims and issue a notice of allowability. If any issues remain, the examiner is invited to contact the undersigned.

Respectfully submitted,



Hugh P. Gortler
Reg. No. 33,890

Honeywell International Inc.
Law Department, AB2
P.O. Box 2245
Morristown, NJ 07962-9806
(310) 512-4885

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